Alliance for the Great Lakes

Jamie Cross, Adopt-a-Beach™ Manager

ALLIANCE FOR THE GREAT LAKES
ENSURING A LIVING RESOURCE FOR ALL GENERATIONS

Adopt-a-Beach™

On the Ground Action

On the Ground Action

On the Ground Action

On the Ground Action

ITEMS COLLECTED

Pick up ALL debris items that you find. Only record information for the items listed below. If you find an item that is a concern or in abundance that is not listed below, mark in the "Misc. Items" section.

EXAMPLE	TOTAL #
Plastic Bags 𝍸 III	= 8

Please DO NOT use words or check marks. Only **numbers** are useful data.

MOST LIKELY TO FIND ITEMS	TOTAL #
Cigarette Butts	=
Food Wrappers (candy, chips, etc.)	=
Take Out/Away Containers (Plastic)	=
Take Out/Away Containers (Foam)	=
Bottle Caps (Plastic)	=
Bottle Caps (Metal)	=
Lids (Plastic)	=
Straws/Stirrers	=
Forks, Knives, Spoons	=

MOST LIKELY TO FIND ITEMS	TOTAL #
Beverage Bottles (Plastic)	=
Beverage Bottles (Glass)	=
Beverage Cans	=
Grocery Bags (Plastic)	=
Other Plastic Bags	=
Paper Bags	=
Cups & Plates (Paper)	=
Cups & Plates (Plastic)	=
Cups & Plates (Foam)	=

FISHING GEAR	TOTAL #
Fishing Buoys	=
Fishing Net & Pieces	=
Fishing Line (1 yard/meter = 1 piece)	=
Rope (1 yard/meter = 1 piece)	=

PACKAGING MATERIALS	TOTAL #
6-Pack Holders	=
Other Plastic/Foam Packaging	=
Other Plastic Bottles (oil, bleach, etc.)	=
Strapping Bands	=
Tobacco Packaging/Wrap	=

OTHER TRASH	TOTAL #
Appliances (refrigerators, washers, etc.)	=
Balloons	=
Cigar Tips	=
Cigarette Lighters	=
Construction Materials	=
Fireworks	=
Tires	=
Discarded Food	=

PERSONAL HYGIENE	TOTAL #
Condoms	=
Diapers	=
Syringes	=
Tampons/Tampon Applicators	=

TINY TRASH LESS THAN 2.5 cm	TOTAL #
Foam Pieces	=
Glass Pieces	=
Plastic Pieces	=

2.5 cm (actual size)

MISC. ITEMS OF LOCAL CONCERN: Include item description and number of items found.	TOTAL #
1.	=
2.	=
3.	=

NOTE TO TEAM LEADERS–Please tally your results onto a final data form and enter your data online at www.greatlakesadopt.org

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Adopt-a-Beach™ System

Historical Litter Monitoring and Routine Visit Data

Find and download data collected during beach cleanups

Data is available from 2002 onward.

Beach Location

Beach Name:

Waterbody Name:

State / Province:

County:

City:

Event Date Range

Start Date Range:

End Date Range: 4/3/2014

Primary Sponsor:

Search Clear

twitter YouTube face

Litter on Lake Michigan beaches at multiple scales: density, sources, and accumulation rates

Timothy Hoellein[1], Meagan Westhoven[1],
Erin O'Connell[1], Olga Lyandres[2], Jamie Cross[2]

[1]Loyola University of Chicago

[2]Alliance for the Great Lakes

Great Lakes Beach Conference: State Of the Lake 2015


Accumulation
Afitplanet.com


TRUST
LIBERTY
2004
Decomposition


Ingestion
Ecowatch.com

Air and water show North Ave beach Chicago

Why count litter on Great Lakes beaches?

Counting litter is Step 1 in a larger process

We count and categorize litter to:

- → Learn the sources and fate of litter
- → Measure 'life span' and impact on living things
- → Develop efficient, sustainable solutions to reducing litter

This process is well underway for ocean beaches, but is rare for freshwater environments

Ongoing projects

Two research projects to assess litter abundance on Lake Michigan beaches

1. Density and source of litter at the lake scale
   - Data from Alliance for Great Lakes, Adopt-a-Beach program
   - Citizen-scientists collect and record litter abundance for 200 beaches

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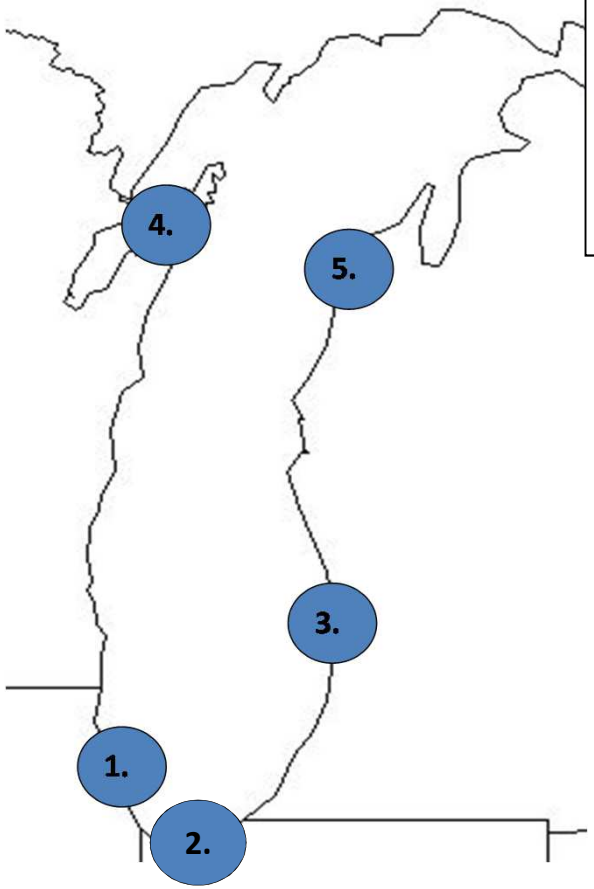
2. Spatial and temporal variation in litter at the beach scale
   - Manual litter collection at Pratt Beach, Chicago IL
   - Student-scientists at Loyola collect and record litter abundance along permanent sampling transects (1 year data collection)

Current research follows questions from our 1st project



Contents lists available at ScienceDirect

Journal of Great Lakes Research

journal homepage: www.elsevier.com/locate/jglr

Abundance and environmental drivers of anthropogenic litter on 5 Lake Michigan beaches: A study facilitated by citizen science data collection

Timothy J. Hoellein [a,*], Meagan Westhoven [a], Olga Lyandres [b], Jamie Cross [c]

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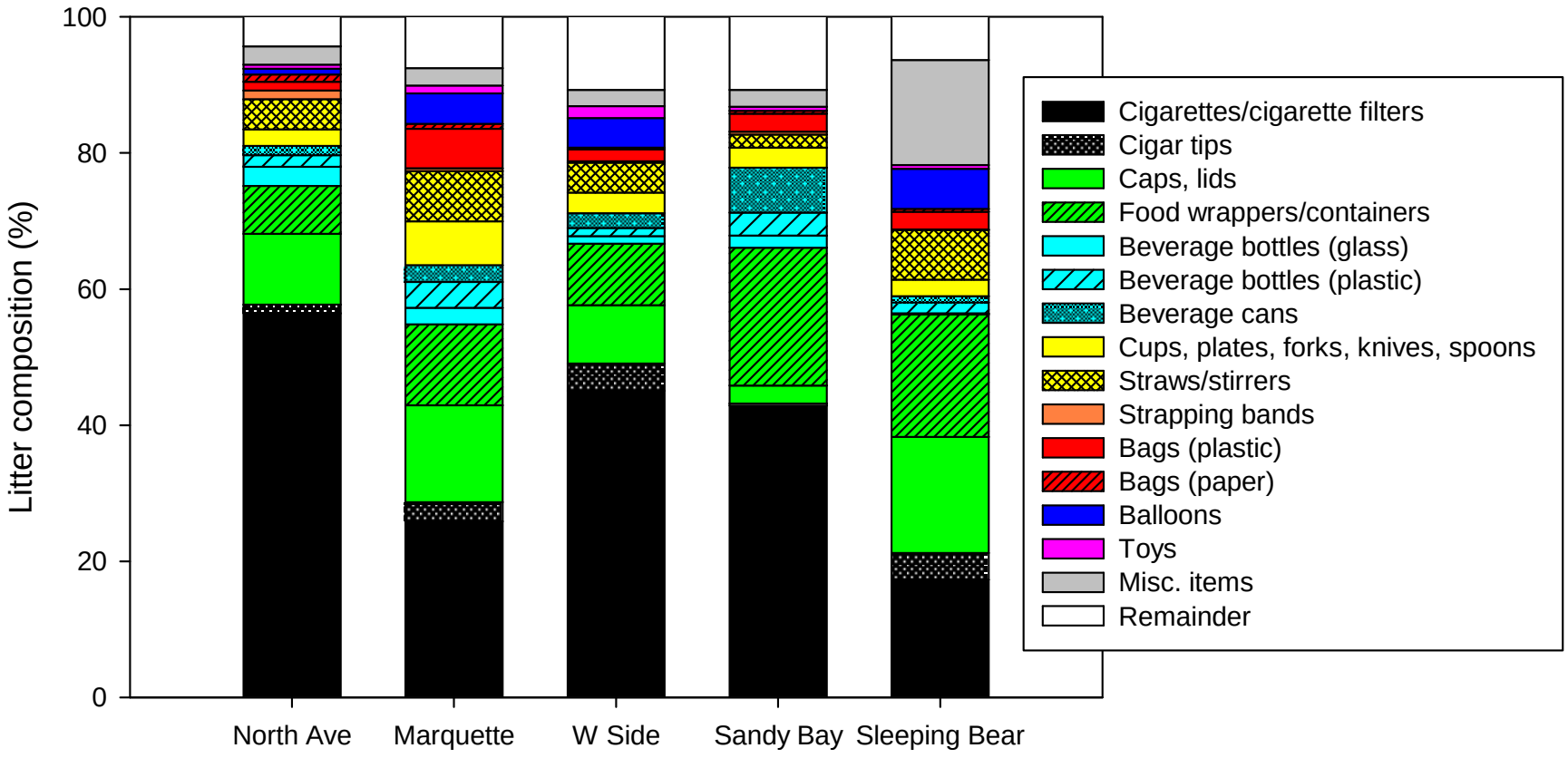
[b] Alliance for the Great Lakes, 150 N. Michigan Avenue, Suite 700, Chicago, IL 60601, USA
[c] Alliance for the Great Lakes, 41 Washington Avenue, Harborfront Place Suite 280D, Grand Haven, MI 49417, USA

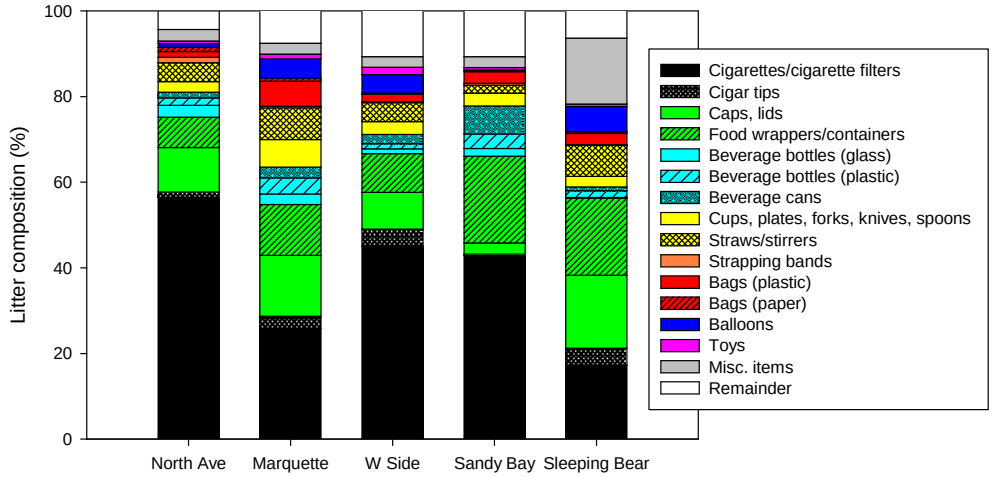
Analyzed AGL data for 5 beaches:

1. *North Avenue*
2. *Marquette Park*
3. *West Side County Park*
4. *Sand Bay 1*
5. *Sleeping Bear Dunes*

Most litter is consumables, from visitors

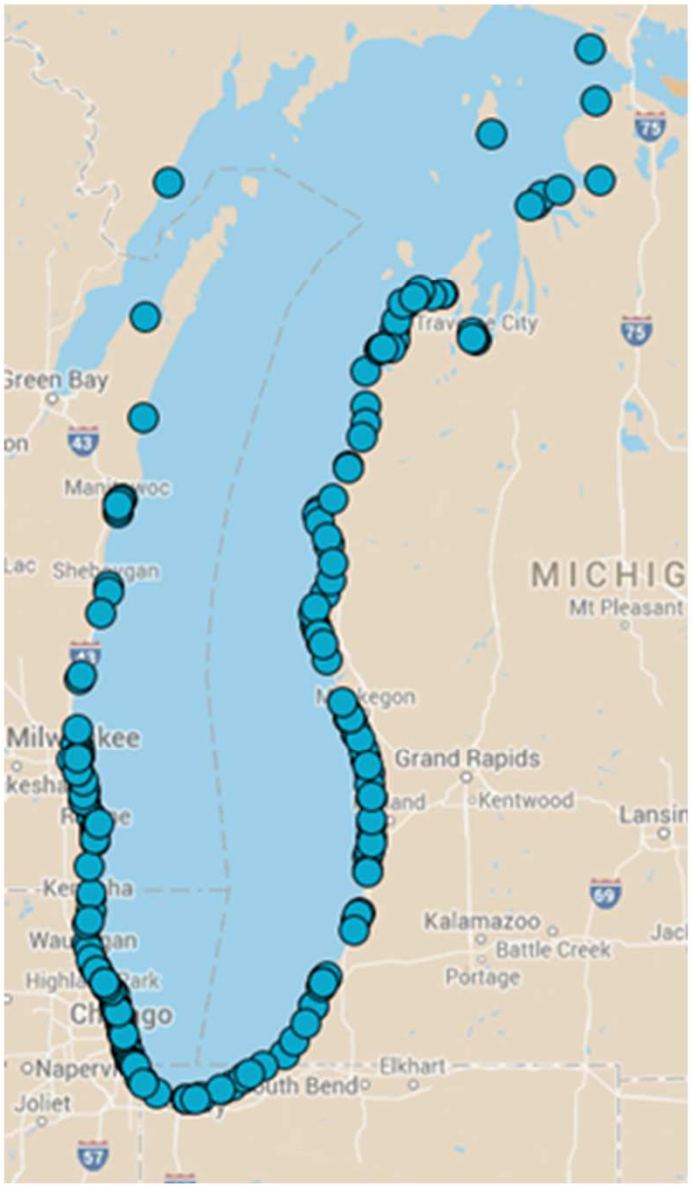


Most litter is consumables, from visitors



- For ocean beaches, fishing activity and rivers are a major source of litter
- Across all Lake Michigan beaches, do fishing and rivers make major contributions to litter?

Study Sites



Study site selection:

Beach data set must:

1) have at least 5 data collection events, >0 AL items collected at each event

2) include correct GPS coordinates

N_{beach} = 203 beaches

Area = 5,401,773 m^2 cleaned

N_{events} = 3,451 beach cleaning events

N_{AL} = 2,771,079 AL pieces collected

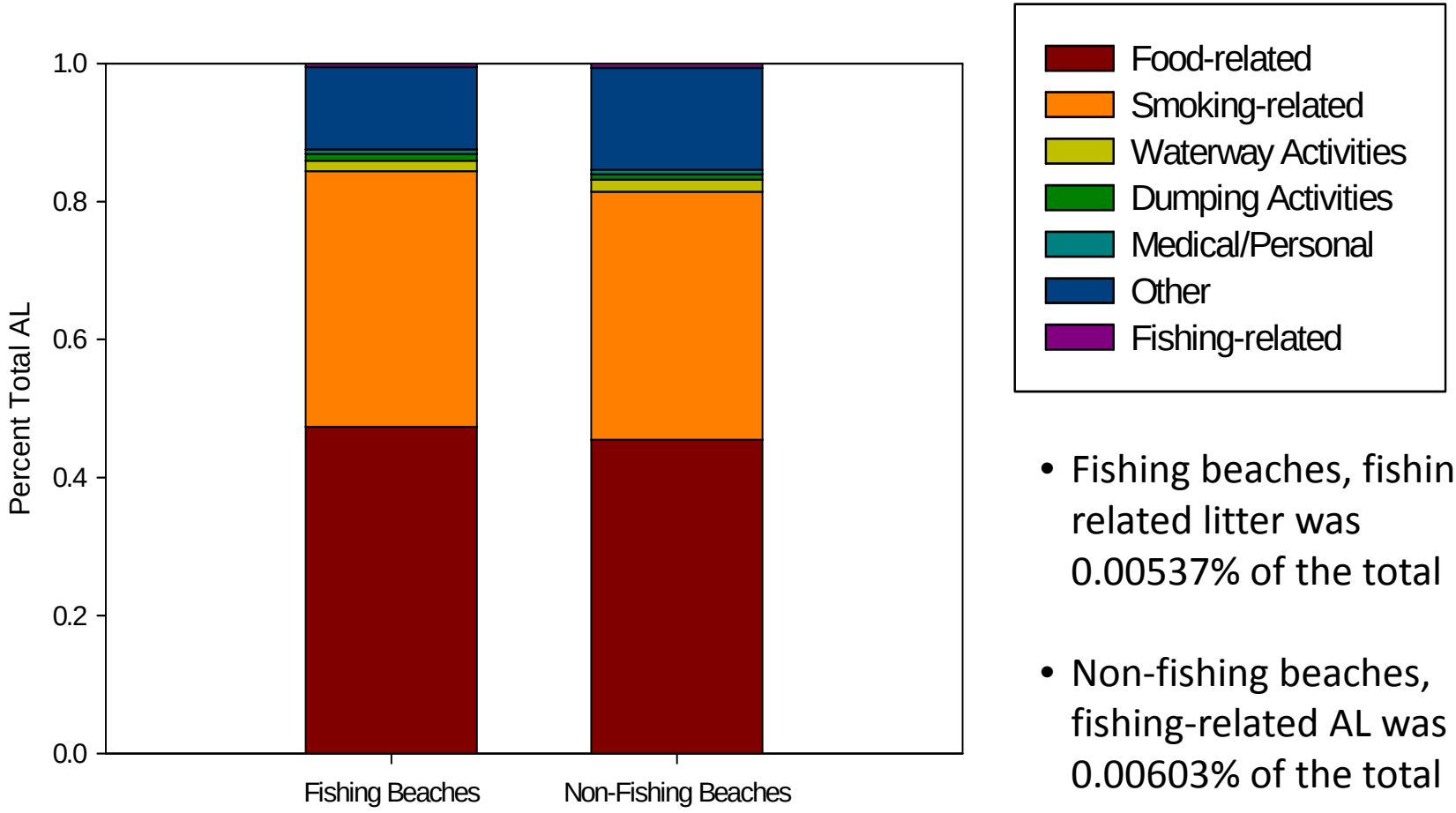
$N_{vol(hr)}$ = 88,233.8 volunteer hours

Questions

1. Across all Lake Michigan beaches, does fishing make a major contribution to litter?

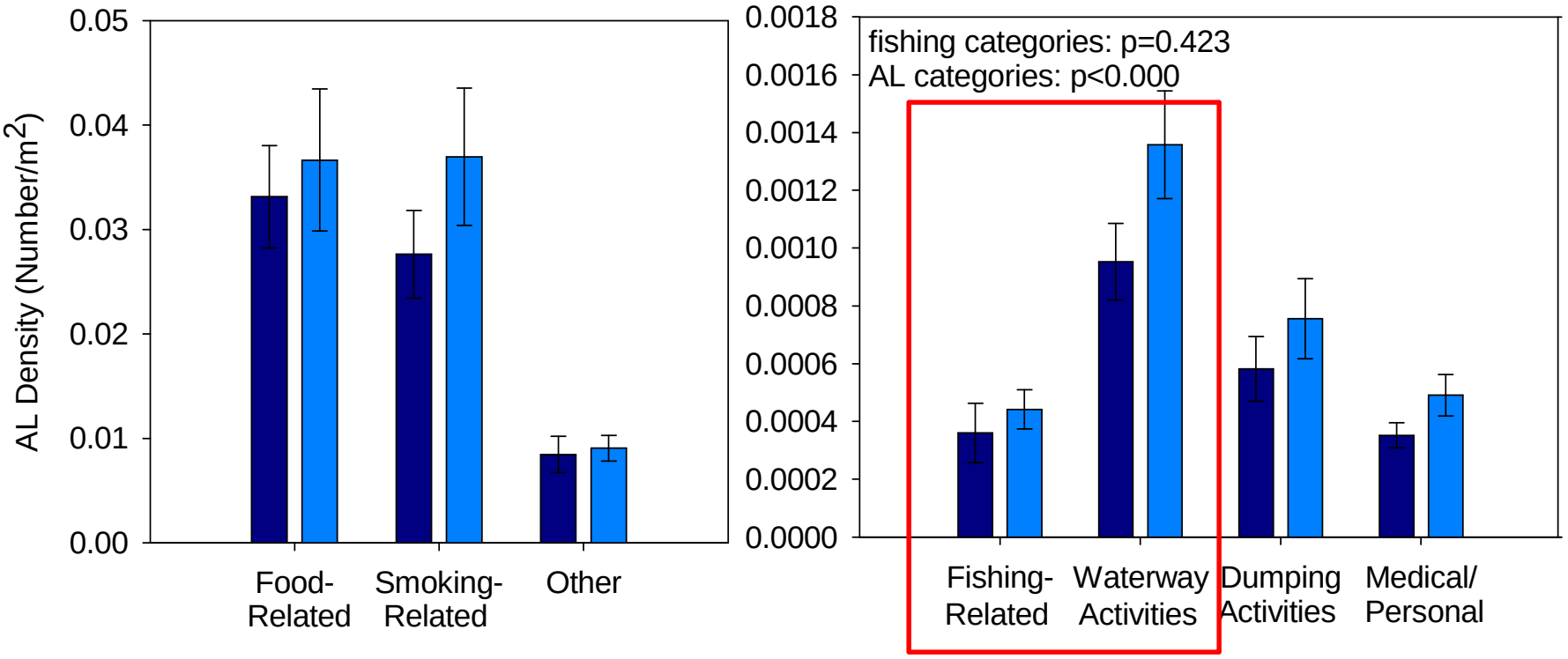
Prediction: Yes, fishing sites will have more litter overall and more fishing-related litter than non-fishing sites

No difference in litter composition at fishing beaches, non-fishing beaches



- Fishing beaches, fishing-related litter was 0.00537% of the total
- Non-fishing beaches, fishing-related AL was 0.00603% of the total

Fishing beaches, non-fishing beaches – same abundance of litter by category type



Questions

1. Across all Lake Michigan beaches, does fishing make a major contribution to litter?

Answer: No

Questions

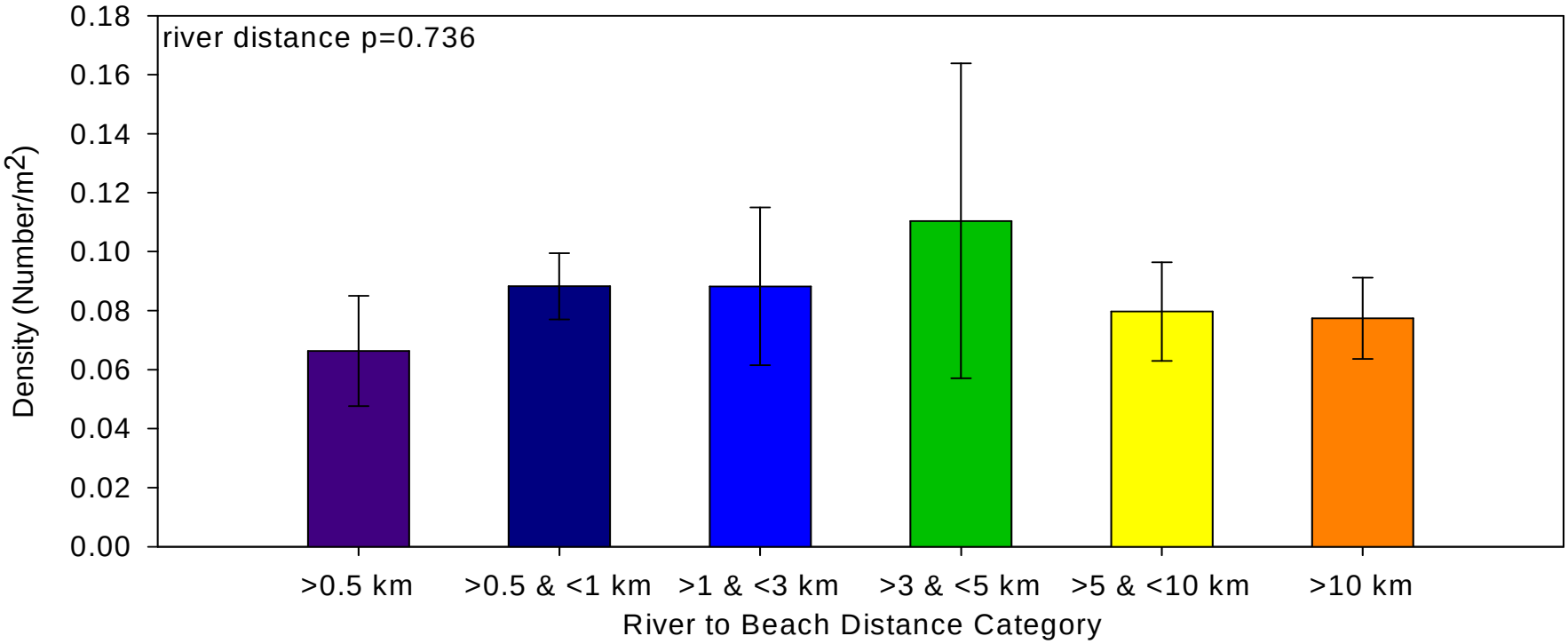
1. Across all Lake Michigan beaches, does fishing make a major contribution to litter?

Answer: No

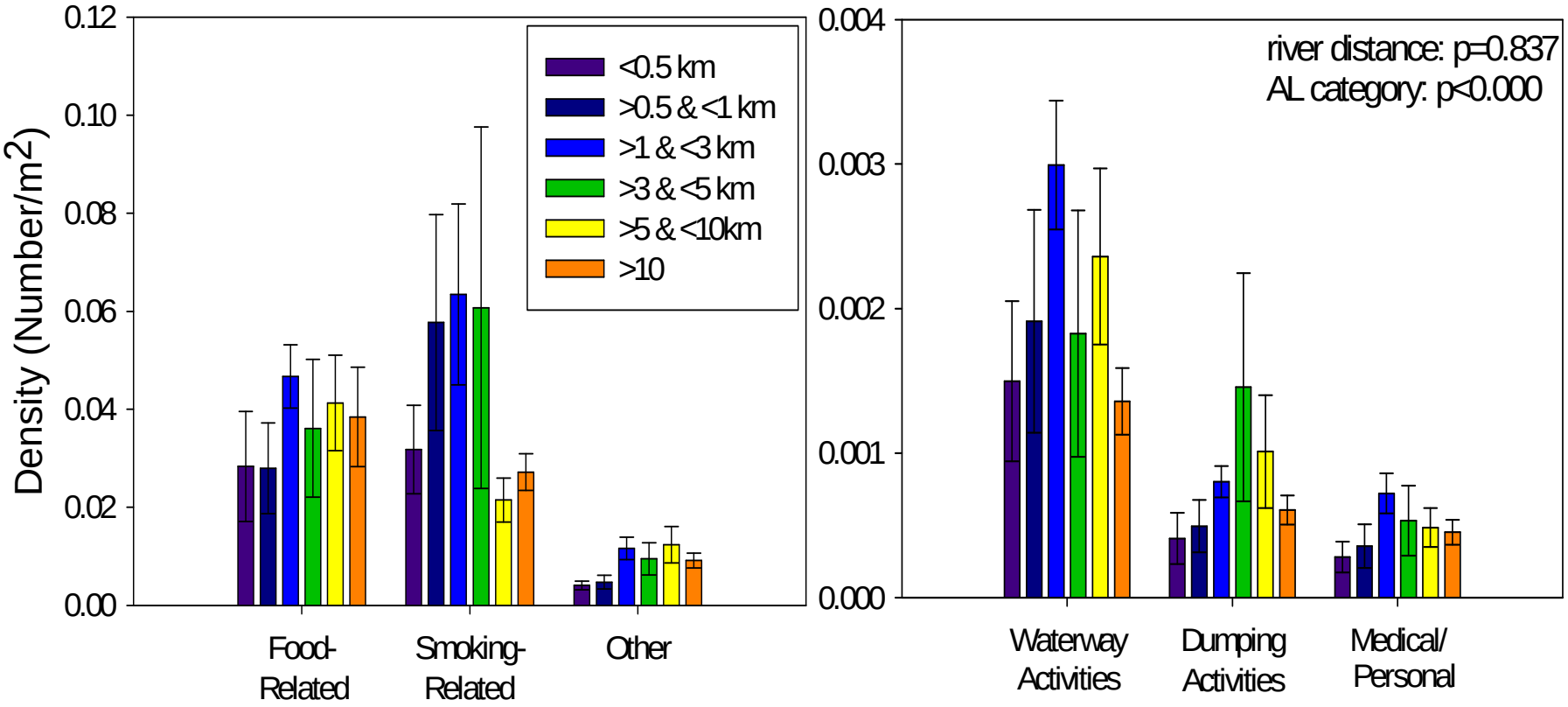
2. Across all Lake Michigan beaches, does river proximity affect litter density and composition?

Prediction: More litter closer to river mouths

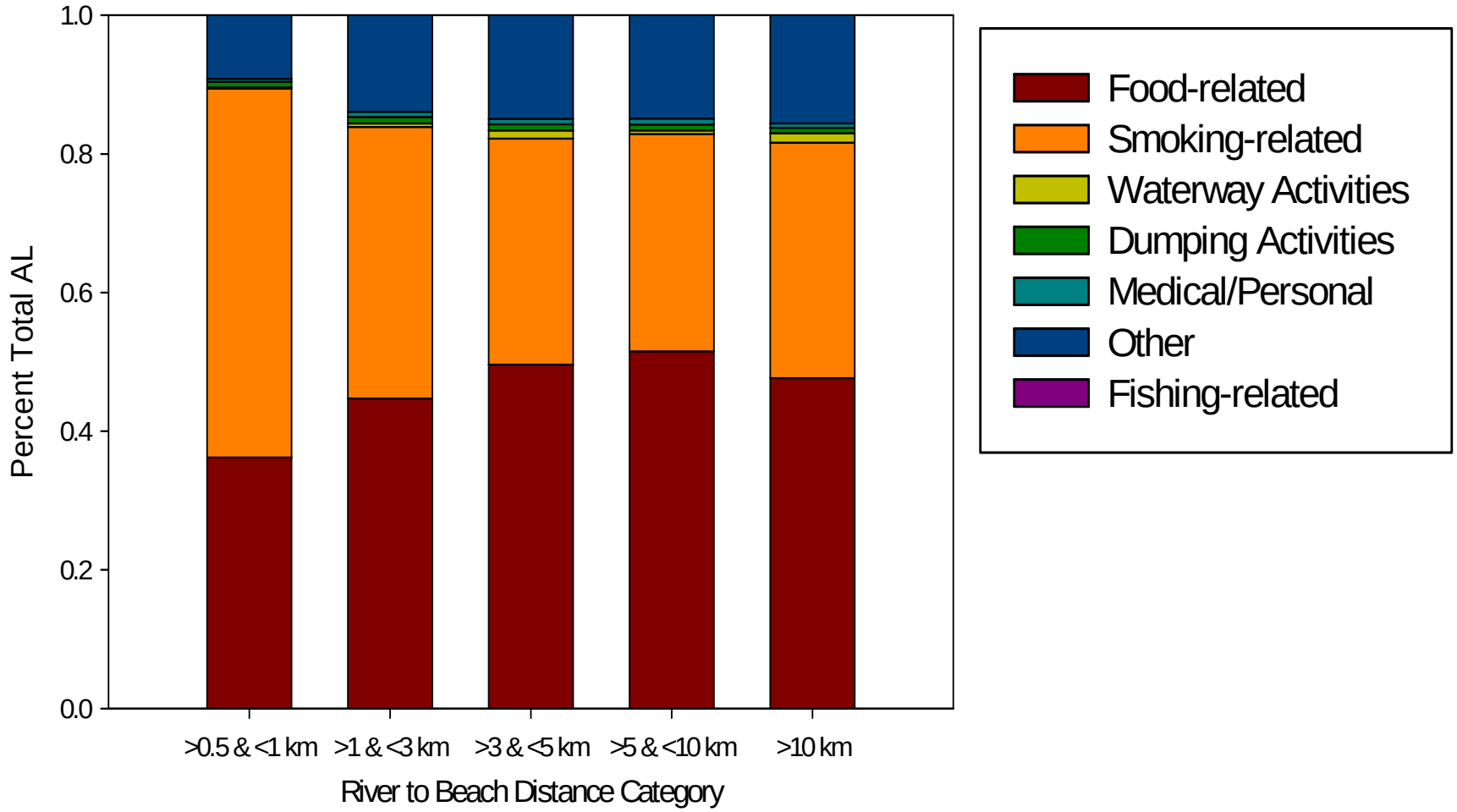
River proximity unrelated to litter abundance



River proximity unrelated to litter abundance by category type



Regardless of river proximity: Most litter is food- and smoking-related



Questions

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Answer: No

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Answer: No

Litter density related to population density

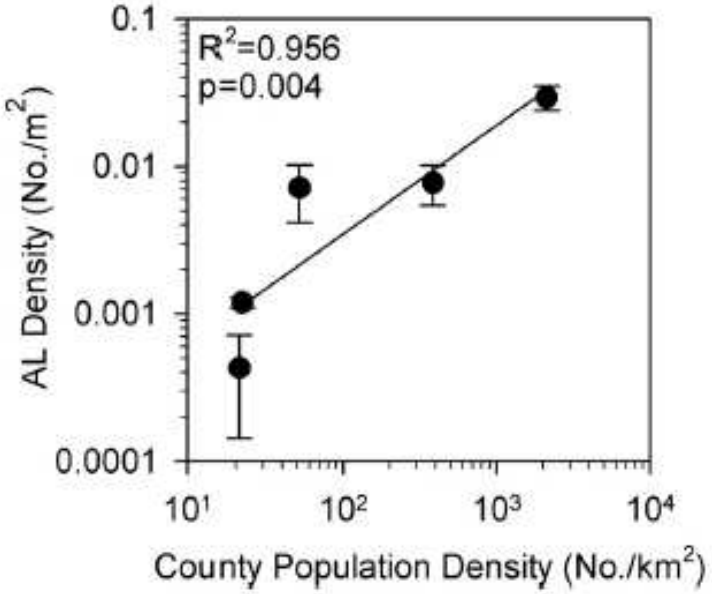
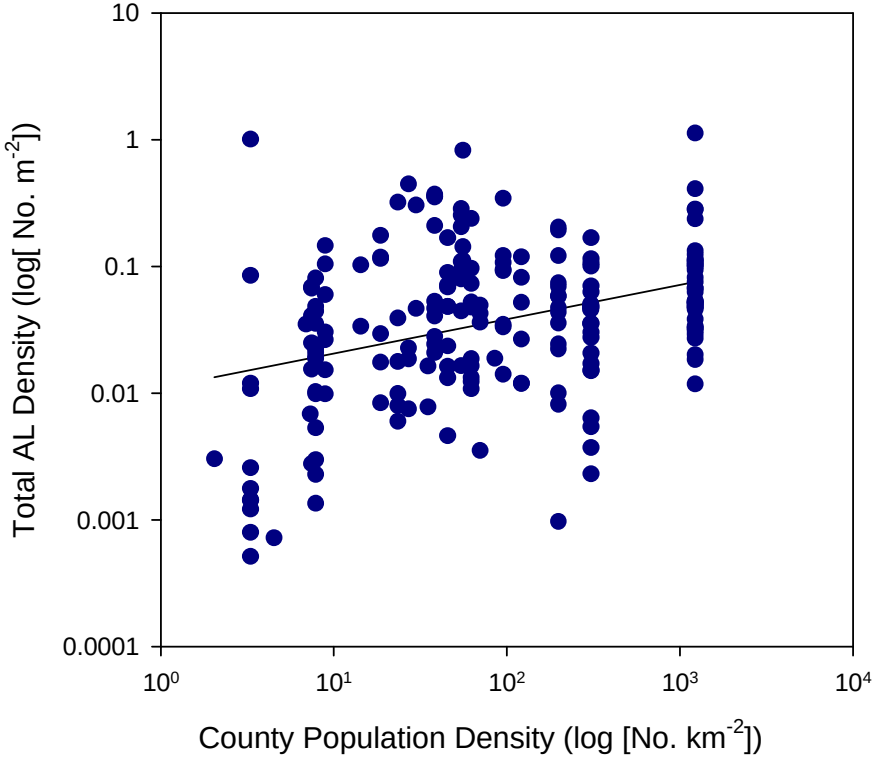


Fig. 5. Simple linear regression between county population density and mean (± SE) anthropogenic litter (AL) density.



Hoellein et al. 2015.

Current project

Why count litter on Great Lakes beaches?

→ Learn the sources and fate of litter

a. Patterns at 200 Lake Michigan beaches similar to our initial analysis of 5 beaches.

Biggest sources at these beaches: Smoking, eating, drinking

Population density (also likely visitor density) drives litter

b. Non-significant sources: fishing and river proximity

Major difference from ocean beaches

Different prevention or management strategies may be required.

For example, direct at visitors rather than anglers or wastewater.

Ongoing projects

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Citizen-scientist data

Pros

- Lots of data
- Sites, dates

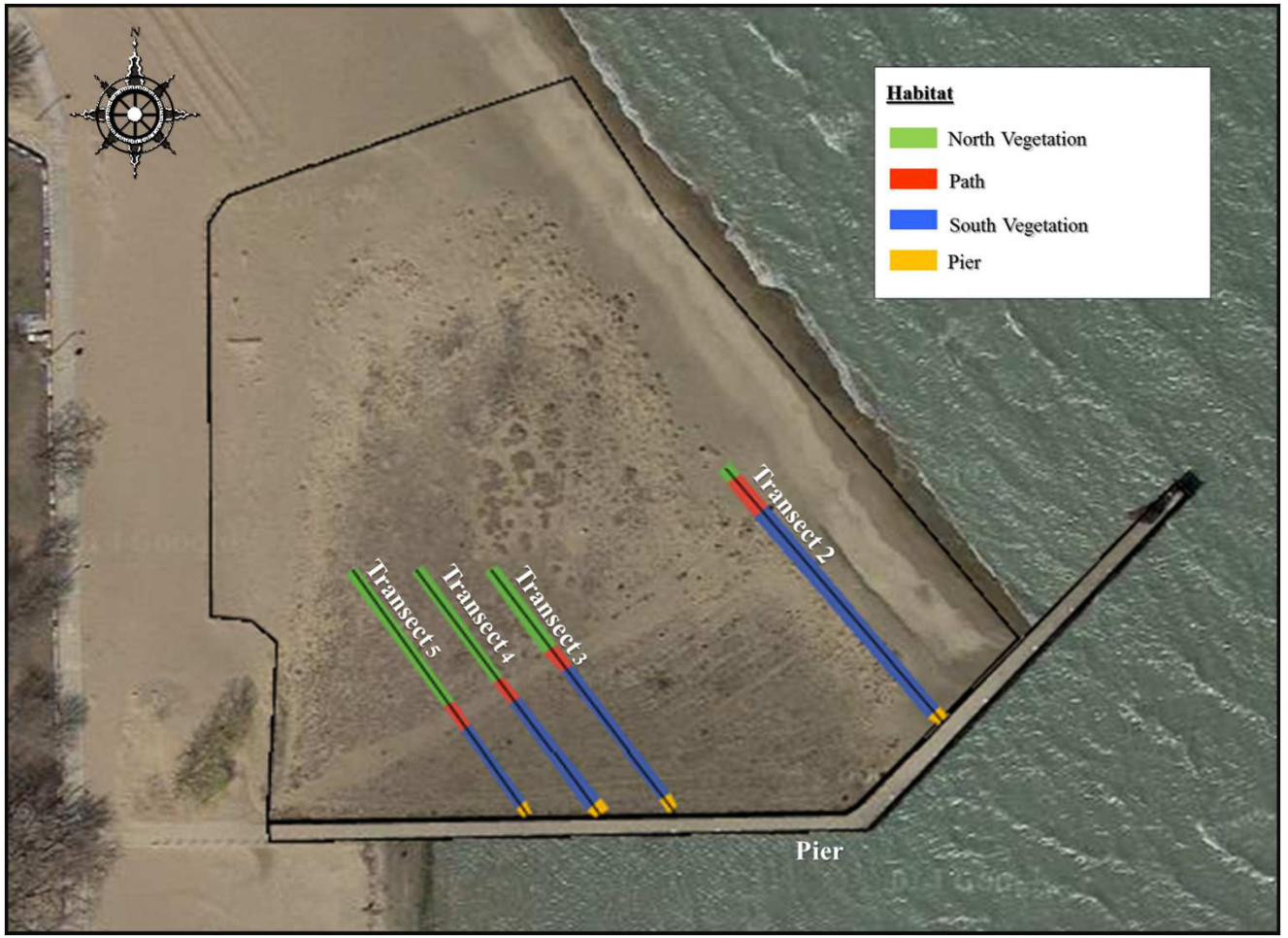
Cons

- Uncertainty in search area
- Consistency of effort
- Size of litter collected

Study Site: No municipal cleaning, careful measurements of density

Dune restoration

- Limited access
- Sheridan/Pratt



Why count litter on Great Lakes beaches?

→ Learn the sources and fate of litter

Major sites of litter accumulation: Areas near walking trails and vegetation adjacent to water-line accumulate.

Prioritize those sites for clean-up efforts?

Litter quickly re-accumulates, litter is in *motion*

More frequent clean-ups, more litter found

Litter collection by volunteers might represent an underestimate,

Better delineation of search area?

Municipal cleaning – suggest it is effective for litter reduction

Sites where machines can't reach?

→ Develop efficient, sustainable solutions to reducing litter

- Additional signs (perhaps with data?)
- Abundant sites for garbage disposal (including ashtrays?)
- Education at schools and volunteer events (underway)
- Distribution of litter data with event permitting
- Fines – Bans (plastic bags and microbeads)
- Empirical tests for these strategies – are they effective?

Next steps

- Apply approach to more beaches in AAB database
- Measure:
  - ‘Missing litter’ components (including microplastic)
  - Annual rate of litter accumulation
  - Litter collection rate by municipal beach cleaning
  - Decomposition rates and effects on organisms (including microplastic)

Thank you!

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- Mulcahy Fellowship

Collaborators

- John Kelly
- Sherri Mason
- Olga Lyandres
- Jamie Cross
- Litter collectors

Graduate Students

- Amanda McCormick
- Michael Hassett

Undergraduate Students

- Meagan Westhoven
- Erin O'Connell
- Anna Vincent
- Adam Pink
- Joseph Gasior
- Owen McKenna
- Thomas Manghi
- Steven Polaskey